

3.5 CAPACITY ANALYSES

3.5.1 Street Segments / Freeway Segments

The traffic volumes reported in Table 3.3 were obtained from Caltrans published traffic count data (see Traffic and Vehicle Data Systems Unit⁸) and updated for this study to the Year 2003 levels using growth trends from Year 1999, 2000, and 2001 counts. Freeway volumes and levels of service are an important factor in traffic planning within the City of Grass Valley. This is because if the freeway is not operating at satisfactory levels of service, the City Streets will be adversely affected, as they are interrelated.

**TABLE 3.3, FREEWAY SEGMENTS
Daily Traffic Volumes Levels of Service**

Road	Location	Lanes		Existing 2003			2020		
		2003	2027	Peak	ADT	LOS	Peak	ADT	LOS
State Route 49/20	S of N. Auburn St	4	4	3,280	38,190	A	5,398	62,850	C
State Route 49/20	S of Bennett St	4	4	4,650	46,310	A	4,926	49,061	A
State Route 49/20	S of Idaho-Maryland	4	4	5,130	48,400	A	5,534	52,209	B
State Route 49/20	S of Dorsey	4	4	4,200	40,370	A	5,036	48,404	A
State Route 49/20	S of Brunswick Rd	4	4	4,200	40,370	A	4,427	42,549	A
State Route 49/20	N of Brunswick Rd	4	4	3,530	37,790	A	4,040	43,250	A
State Route 49	S of Crestview/Smith	4	4	2,200	22,210	A	3,404	34,367	A
State Route 49	N of Crestview/Smith	4	4	3,000	25,410	A	3,616	30,630	A
State Route 49	S of SR 20	4	4	3,000	32,500	A	4,445	48,154	A
State Route 20	W of Mill St	4	4	1,720	17,800	A	1,940	20,072	A
State Route 20	W of SR 49	4	4	1,760	19,580	A	2,709	30,139	A
State Route 20	W of Brighton	4	4	1,720	17,800	A	1,940	20,072	A

Source: Caltrans and NCTC Traffic Model

ADT = Average Daily Traffic

Peak = PM Peak Hour Traffic

LOS = Level of Service

It is important to note that the LOS reported in Table 3.3 is a "planning level analysis" for daily ADT traffic only, wherein a measured/projected traffic volume for the freeway segment is compared to a look up table for capacity/LOS⁹. This level of analysis does not take into account any specific topography, grade, weaves, curves, short segments, frequent ramps, trucks,

⁸ See Traffic Volumes link on

<http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/index.htm>

⁹ Daily Planning Service Volume Criteria for a four lane freeway is as follows:

LOS A = 59,400, LOS B = 69,300, LOS C = 79,200, LOS D = 89,100, LOS E = 99,000
(source: Grass Valley General Plan, Table 4-2)



and other factors which can complicate the actual traffic operations on the freeway. Table 3.3 basically indicates that, barring all of these other factors, the reported level of service would likely exist. However, in Grass Valley, the freeway systems are often impacted by short segments, frequent ramps, truck traffic, grade and topography, as well as short weaving or merge/diverge sections, etc. The traffic operations level of service for freeways can be calculated using software and utilizing the variety of roadway/traffic characteristics data for the peak hour time periods, if available. As a result of these traffic operational dynamics it is often unsatisfactory to analyze traffic levels of service on an intersection basis alone. Determination of level of service at most intersections within the City requires additional traffic operations analysis methods such as using SynchroPro and SimTraffic software (simulation technology). In order to calculate traffic operations level of service it is necessary to have a variety of peak hour data. Due to the complex and data-intensive nature of an "operations" analysis, a planning level analysis such as that used in the City of Grass Valley's General Plan Circulation Element is often used. This same line of reasoning is applicable to surface streets within the City as well as the freeways. Detailed data and field observations, beyond just knowing the facility type and roadway daily volume, is needed to ascertain a traffic operations level of service. This section addresses this important issue.

3.5.2 Levels of Service for Surface Streets in Grass Valley

The 1999 Grass Valley General Plan Circulation Element section reported levels of service for numerous street segments in the City, using a "planning level analysis" look-up table approach for levels of service. The document also reported intersection levels of service based on analysis methods that are currently outdated in the traffic engineering / planning profession.¹⁰ Even so, each intersection was reported individually and separately without regard to the potential operations effects of closely spaced adjacent intersections or freeway ramps, etc.. In the General Plan document the levels of service for various street segments did not necessarily match the intersection levels of service on the same street segments, for this same reason.

The true level of service for the street would of necessity be a value somewhere between the LOS A for the free-flow conditions mid-block, and

¹⁰ Levels of Service in the 1999 General Plan were determined for intersections using procedures outlined in the 1994 Highway Capacity Manual (HCM). This method has since undergone a major update in the Year 2000, using updated procedures based on newer national research data. The 1994 HCM has been replaced with the 2000 HCM. Results with current methodology may be different than those obtained with the 1994 methods.



the LOS F conditions at the busy intersection at the end of the street segment. What this communicates is that there is no delay to motorists mid-block, but there is delay at the intersection. The average delay through the street then is somewhere in between the two extremes. The "composite" level of service for a street segment is actually a combination of the intersection LOS and traffic activity in the mid-block street segment. If a certain intersection has LOS F conditions and traffic backs up well beyond the mid-block location, then it can be said that the intersection operations actually control the levels of service on the street segment, despite what a "planning level" analysis might show for the segment.

3.5.3 Deficiencies

Grass Valley has several existing street segments that are affected by poorly operating intersections. A few of these include:

- The closely spaced intersections of Main Street at South Auburn and Mill operate so poorly as to cause traffic to back up on a daily basis to Alta Street (back through four intersections along the segment).
- Idaho Maryland at East Main Street operates at LOS F conditions in peak hour time periods, and traffic backs up on Idaho Maryland under the freeway back to the EB ramps intersection.
- The South Auburn / Colfax / Neal intersection operates poorly due to closely spaced adjacent intersections, etc.
- Mill Street at McCourtney and SR 20 WB ramps.
- McKnight Way corridor from Freeman Lane to La Barr Meadows Road.

The City's Circulation Element called for several improvements to be implemented by the Year 2020. The 1999 General Plan identified four roads as failing to deliver LOS D for existing conditions. These are shown in Table 3.4 along with additional roads which are added in this report. The level of service for roads not identified in the General Plan, but identified in Table 3.4 were calculated using a combination of the daily traffic volume and the known pm peak hour condition along the road at the adjacent intersections. The peak hour condition at the Idaho Maryland and East Main Street intersection drives the level of service in the immediate vicinity. The same is true for the intersection of West Main Street at Mill Street, etc.

The City intends to mitigate these roadway deficiencies through its Capital Improvement Program. In the General Plan, LOS was estimated for future conditions to ensure that a roadway will provide acceptable operations for its "design life", which is commonly 20 years.



The year 2020 was used in the General Plan analysis for estimating traffic demand and determining LOS on the roadway system. The City has established Level of Service "D" as the goal for both the General Plan and for the development of Citywide and regional traffic impact fees.

Table 3.4, Existing Surface Street Level of Service Deficiencies

In GP?	ROAD	LOCATION	# OF LANES	ADT	LOS
Y	Sutton Way	W of Brunswick Road	2	13,661	E
Y	Brunswick Road	S of Idaho Maryland Road	2	14,504	E
Y	Brunswick Road	NW of Loma Rica Drive	2	14,056	E
Y	Nevada City Hwy	Grass Valley City Limits	2	14,355	E
N	Idaho Maryland	East of E. Main Street	2	12,111	E
N	E. Main Street	N of Idaho Maryland	3	15,111	E
N	W. Main Street	W of S. Auburn Street	2	11,333	E
<i>Source: 1999 Grass Valley General Plan and PRISM Engineering</i>					

Tables 3.5, and 3.6 report the various surface street capacity analysis results from the City's 1999 General Plan capacity analysis, and compares these in a side-by-side format with the newer NCTC traffic model projections and comparable capacity analysis. Where the newer NCTC numbers have decreased, they are shown in green, and where they have increased, a red number. There are several locations that will be deficient in the future, not identified in the General Plan, such as Main Street, etc. These are identified in the tables as arterials or collector roadways with an LOS E or LOS F rating.



Table 3.5 Arterial Roadway Daily Traffic Volumes LOS

Legend: **59,123** Traffic volume has decreased with new NCTC model versus 1999 Model for same Year 2020 time period.

45,027 Traffic volume has increased with new NCTC model versus 1999 Model for same Year 2020 time period.

Road	Location	No. of Lanes		Existing		2020 NCTC	
		Now	2020	ADT	LOS	ADT	LOS
State Route 174	E of SR 20	2	2	6,200	A	8,027	A
State Route 174	E of Central St	2	2	4,500	A	6,311	A
State Route 174	E of Ophir St	2	2	5,100	A	9,882	C
State Route 174	S of Race St	2	2	5,400	A	10,042	C
State Route 174	E of Empire Mine	2	2	5,600	A	11,781	D
South Auburn St	S of Main	2	2	8333.3	A	13,189	D
South Auburn St	S of Mohawk St	2	2	7,802	A	11,956	D
South Auburn St	N of School Alley	2	2	6,852	A	10,778	C
South Auburn St	N of Whiting St	2	2	7,139	A	12,826	D
South Auburn St	NW of E. McKnight Way	2	2	8,228	A	9,877	C
Bennett Road	E of SR 49/20	2	2	5555.6	A	9,424	C
Brighton Extension	S of McCourtney (2)	2	2	NA	NA	NA	NA
Brighton Extension	W of Allison Ranch Rd	2	2	NA	NA	NA	NA
Brunswick Road	On Overcrossing 49/20	4	4	26,172	D	22,094	B
Brunswick Road	N of Dorsey Drive	2	2	12,235	C	12,802	C
Brunswick Road	N of Whispering Pines	2	3	14,504	E	20,880	D
Brunswick Road	NW of Loma Rica Dr	2	3	14,056	E	19,776	C
Brunswick Road	NW of E. Bennett	2	3	10,686	B	15,775	B
Centennial Drive	S of Idaho Maryland	2	2	NA	NA	NA	NA
Crestview/Smith Ext	E of Allison Ranch Rd	2	2	NA	NA	NA	NA
Crestview/Smith Ext	E of Taylorville	2	2	NA	NA	NA	NA
Dorsey Drive	SE of Segsworth Way	2	2	5,541	A	8,103	A
Dorsey Drive	W of Sutton Way	2	2	5000	A	10,021	B
Dorsey Drive	E of Sutton	2	2	NA	NA	NA	NA
Dorsey/Whispering	N of Idaho Maryland	2	2	NA	NA	NA	NA



Table 3.5 (cont.), Arterial Roadway Daily Traffic Volumes Levels Of Service

Road	Location	No. of Lanes		Existing		2020 NCTC	
		Now	2020	ADT	LOS	ADT	LOS
Dorsey/Whispering	S of Idaho Maryland	2	2	NA	NA	NA	NA
Empire Street	E of Le Duc St	2	2	4,923	A	6,050	A
Idaho Maryland Rd	E of Railroad	2	2	12,111	C	14,992	D
La Barr Meadows	SE of E. McKnight Way	2	2	10,028	B	12,723	D
La Barr Meadows	N of Crestview/Smith	2	2	7,800	A	12,146	D
La Barr Meadows	S of Crestview/Smith	2	2	7,800	A	11,981	D
Main Street	S of Squirrel Creek	2	2	5,763	A	17,132	F
Main Street	W of Auburn	2	2	11,333	C	22,774	F
Main Street	E of Bennett St	2	2	12,172	C	21,510	F
Main Street	N of Idaho Maryland	2	3	15,111	E	17,498	D
McCourtney Road	W of 20 Ramps	2	2	9,000	D	13,691	D
W. McKnight Way	SW of Taylorville Rd	2	4	8,882	A	11,756	A
Mill Street	S of Neal St	2	2	5,786	A	7,378	A
Mill Street	NE of Rhode Island St	2	2	5,750	A	7,271	A
Mill Street	N of McCourtney	2	2	9,000	D	10,276	B
Neal Street	E of Church St	2	2	5,239	A	7,934	A
Nevada City Hwy	Grass Valley City	2	2	14,355	D	14,215	D
Nevada City Hwy	E of Brunswick	2	2	17,111	E	15,671	E
Sierra College Dr	W of Main Street	2	4	4,546	A	11,137	A
Sutton Way	E of Brunswick	2	2	9,040	A	10,327	A
Sutton Way	N of Dorsey Dr	2	2	6,700	C	5,976	A
Sutton Way	S of Dorsey Dr	2	2	6,700	C	6,017	A
Whispering Pines	W of Brunswick Rd	2	2	1,494	A	4,091	A

Legend:

59,123 Traffic volume has decreased with new NCTC model versus 1999 Model for same Year 2020 time period.**45,027** Traffic volume has increased with new NCTC model versus 1999 Model for same Year 2020 time period.

Table 3.6 Collector Roadway Daily Traffic Volumes LOS

GP Node	Road	Location	No. of Lanes		Existing		2020 NCTC	
			Now	2020	ADT	LOS	ADT	LOS
29	Allison Ranch Rd	S of McCourtney	2	2	720	A	845	A
30	Allison Ranch Rd	N of North Star Mine	2	2	665	A	625	A
98	Allison Ranch Rd	S of Crestview/Smith	2	2	500	A	1,447	A
31	Alta Street	N of West Main St	2	2	4,203	A	7,016	B
32	Alta Street	S of Alta Vista Dr	2	2	3,587	A	6,938	B
33	Alta Street	N of Alta Vista Dr	2	2	3,476	A	5,222	A
34	Alta Street	SE of Ridge Road	2	2	3,380	A	5,238	A
96	Old Auburn Rd	S of McCourtney	2	2	1870	A	1,884	A
81	Old Auburn Rd	S of North Star	2	2	1000	A	1,288	A
66	E. Bennett Road	E of Centennial	2	2	2288	A	2,363	A
35	E. Bennett Road	E Grass Valley City	2	2	2,288	A	2,815	A
93	Brighton Street	N of McCourtney	2	2	4975.2	A	6,555	A
37	Brighton Street	S of Chapel	2	2	2,581	A	4,702	A
38	Butler Street	W of Minnie	2	2	813	A	3,297	A
39	Butler Street	E of Packard Dr	2	2	929	A	2,875	A
65	Centennial Drive	N of E. Bennett	2	2	NA	NA	NA	NA
91	North Collector	W of Allison Ranch	2	2	NA	NA	NA	NA
99	South Collector	E of Old Auburn	2	2	NA	NA	NA	NA
100	South Collector	E of North Star Loop	2	2	NA	NA	NA	NA
97	South Collector	W of Allison Ranch	2	2	NA	NA	NA	NA

Primary Source: Table 4-5 1999 Grass Valley General Plan, with supplemental NCTC data

Legend:

59,123 Traffic volume has decreased with new NCTC model versus 1999 Model for same Year 2020 time period.

45,027 Traffic volume has increased with new NCTC model versus 1999 Model for same Year 2020 time period.



Table 3.6 (cont.), Collector Roadway Daily Traffic Volumes LOS

GP Node	Road	Location	No. of Lanes		Existing		2020 NCTC	
			Now	2020	ADT	LOS	ADT	LOS
41	Empire Street	E of Kate Hayes St	2	2	4,278	A	6,171	A
42	E. Empire Street	E Grass Valley City	2	2	4,178	A	5,857	A
43	Freeman Lane	N of McKnight Way	2	2	8,142	C	10,984	E
44	Freeman Lane	SW of McKnight	2	2	1000	A	1,082	A
61	Freeman Lane	E of Mill	2	2	9000	D	10,639	E
45	Hughes Road	NW of E. Main St	2	2	7,852	C	10,702	E
46	Hughes Road	S of Ridge Rd	2	2	3,872	A	6,847	B
47	Idaho Maryland Rd	W of Brunswick	2	2	3,570	A	NA	NA
48	Idaho Maryland Rd	E of Brunswick Rd	2	2	1,918	A	NA	NA
49	McCourtney Road	W of Brighton St	2	2	8,650	C	11,543	F
101	McCourtney Road	W of Old Auburn Rd	2	2	5,676	A	9,249	D
51	Mill Street	N of Bank Street	2	2	5,399	A	5,887	A
52	Richardson Street	E of Alta Street	2	2	1,171	A	1,314	A
53	Ridge Road	W of Ridge Estates	2	2	5,059	A	6,991	B
54	Ridge Road	N of Hughes Rd	2	2	7,815	C	9,063	D
55	Ridge Road	S of Hughes Rd	2	2	7,625	B	10,125	E
88	Ridge Road	W of Alta	2	2	5,339	A	7,557	B
89	Ridge Road	E of Rough & Ready	2	2	4,263	A	6,702	B
56	Sierra College Dr	SE of Ridge Rd	2	2	3,180	A	9,014	D
103	Taylorville	S of McKnight	2	2	NA	NA	NA	NA
104	Taylorville	S of Crestview/Smith	2	2	NA	NA	NA	NA

source: PRISM Engineering ,NCTC Model ver.2003, and Table 4-5 1999 Grass Valley General Plan

Legend:

59,123 Traffic volume has decreased with new NCTC model versus 1999 Model for same Year 2020 time period.

45,027 Traffic volume has increased with new NCTC model versus 1999 Model for same Year 2020 time period.



Several facilities went to worse than LOS D conditions as can be seen in Tables 3.6 and 3.7. The differences between what was reported as deficient in the 1999 General Plan and the revised Year 2020 NCTC traffic model projections analysis results are given in the following list:

3.5.4 Year 2020 LOS Deficiency Changes

- Bennett Road east of SR 20/49 Ramps: went from LOS A to LOS E
- Main Street from Alta to Bennett Street: went from LOS B to LOS F
- Sutton Way west of Brunswick Road: went from LOS A to LOS E
- Freeman Lane north of McKnight Way: went from LOS F to LOS E
- Freeman Lane east of Mill Street: went from LOS D to LOS E
- Hughes Road west of E. Main Street: Went from LOS F to LOS E
- Hughes Road south of Ridge Road: went from LOS E to LOS B
- Mc Courtney Road west of Brighton: went from LOS D to LOS F
- Mc Courtney Road west of Old Auburn: went from LOS E to LOS D
- Ridge Road north of Hughes Road: went from LOS E to LOS D
- Ridge Road south of Hughes Road: stayed at LOS E
- Ridge Road east of Rough and Ready Hwy: went from LOS F to LOS B

3.5.5 Intersection Capacity Analyses

Table 3.8 reports the level of service analysis for critical intersections identified in the General Plan, and compares side by side the more recent findings using the updated NCTC traffic model projections.

The table shows that several intersections will operate at unsatisfactory conditions in the future (highlighted in red) without mitigation. The City's CIP includes projects that will help mitigate these locations to LOS D or better conditions by the Year 2020.



Table 3.8, Intersection Levels of Service (No Mitigation)**

Intersection	ctrl	GP Existing		2020 NCTC	
		LOS	Delay	LOS	Delay
Auburn/Empire	SS	A	9.1	F	98.3
Auburn/Main	SIG	D	35.3	F	87.0
Auburn/Neal	SIG	C	25.0	F	132.0
Auburn/SR 20/49 Frontage	SIG	B	16.7	E	74.0
Bennett/SR 20/49 WB Ramp	SS	A	0.0	E*	26.8
Bennett/SR 20/49 EB Ramp	SS	A	0.0	E*	28.6
Bennett/Centennial	SS	A	0.0	C	19.2
Bennett/Ophir	SS	A	9.0	C	20.2
Brunswick/Dorsey	SIG	A	0.0	D	55.0
Brunswick/Nevada City Hwy	SIG	E	60.0	D	43.0
Brunswick/SR 20/49 EB Ramps	SIG	B	15.0	C	25.6
Brunswick/SR 20/49 WB Ramps	SIG	D	44.6	E	66.0
Brunswick/Sutton	SIG	E	55.1	E	63.4
Brunswick/Whispering Pines	SS	B	11.0	C	22.0
Colfax Hwy/Ophir	SS	A	10.0	C	16.7
Colfax Hwy/SR 20/49 Frontage	SIG	B	13.0	F	114.0
Dorsey/Sutton	SS	B	12.0	B	14.4
Empire/SR 20 NB Ramps	SIG	B	16.2	C	27.5
Empire/SR 20 SB Ramps	SIG	B	19.7	C	30.0
Freeman/McCourtney/Mill/Allison	SS	A	7.8	E*	29.7
Freeman/McKnight	SS	B	10.4	C	24.4
Idaho Maryland/Centennial	SS	A	3.7	A	3.8
Idaho Maryland/SR 20/49 EB Ramps	SS	E	38.0	F	78.0
Idaho Maryland/Sutton	SS	A	1.5	A	1.8
Main/Alta	SS	C	16.0	F	56.4
Main/Bennett/Washington	SIG	B	11.6	B	17.9
Main/Idaho Maryland/SR 20/49 SB Rmp	SS	E	46.0	F	103.5
McCourtney/Brighton	SS	B	12.9	F*	33.6
McCourtney/SR 20 EB Ramps	SS	A	4.8	F*	23.5
McKnight/SR 49 NB Ramps	SIG	B	19.6	E*	24.7
McKnight/SR 49 SB Ramps	SIG	C	22.6	E*	26.5
Mill/Neal	SS	A	8.7	F	56.1
Mill/SR 20 WB Ramps	SS	B	12.9	E*	14.3
E. Main Street/Hughes	SIG	C	20.0	C	21.9
E. Main Street/Sierra College	SIG	C	21.5	C	31.6
Ridge/Hughes	SS	A	7.1	A	9.2
Sierra College/Morgan Ranch/Ridge	SS	A	5.5	C	24.0

Source: NCTC data and PRISM Engineering Reports

*Due to **closely spaced intersections**, LOS E or LOS F will result in future.

** The Dorsey Drive interchange is assumed to be in place for the 2020 NCTC scenario. The Bennett/Main signal is assumed to be in place for existing conditions (June 2004)

Note: Delay is in average seconds per vehicle at intersection

